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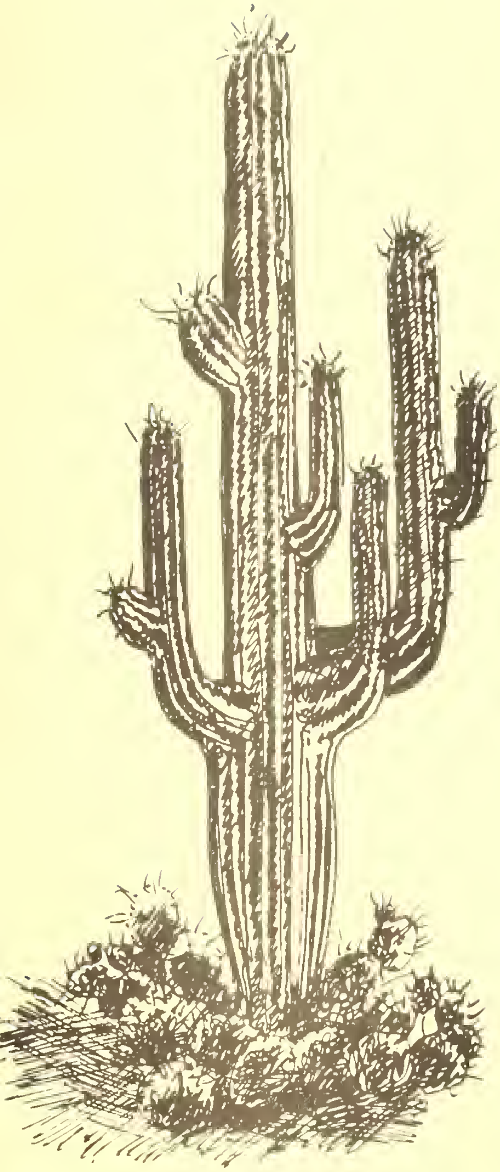

Cooperative National Park Resources Studies Unit

ARIZONA

TECHNICAL REPORT NO. 37

THE AMPHIBIANS AND REPTILES AT SAGUARO NATIONAL MONUMENT

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University of Arizona/Tucson - National Park Service

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AT
SAGUARO NATIONAL MONUMENT, ARIZONA

Technical Report No. 37

Prepared for Saguaro National Monument in 1986

by

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June 1991

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INTRODUCTION

Among the National Parks and Monuments of the United States, the herpetofauna at Saguaro National Monument (SAGU) in southern Arizona is especially rich in species. In a total of 56 verified native species, 7 are anuran amphibians (frogs and toads), 3 are turtles including the Desert Tortoise, 19 are lizards including the Gila Monster, and 27 are snakes (Table 1). The non-native (introduced) Bullfrog (*Rana catesbeiana*) is established on site, bringing the known total of amphibians and reptiles to 57 species. An additional 6 "hypothetical" species may occur, as discussed, for a potential total of 63.

The richness in species is a reflection of the high environmental diversity on site, extending from desertscrub to coniferous forest across an elevational gradient of over 6600 ft (1.25 vertical miles), between 2020 ft in the Sonoran Desert of the western Monument section (Tucson Mountain District) and 8666 ft at the summit of Mica Mountain in the Rincon Mountains of the eastern Monument section, the Rincon Mountain District.

Ecology of the herpetofauna is discussed; information is summarized in Table 1. Additional ecological annotations for these species are provided in Lowe (1964a), Lowe et al. (1986), Black (1982), and Stebbins (1985).

HABITATS AT SAGUARO NATIONAL MONUMENT

Natural biotic communities at Saguaro National Monument, as discussed below, are indicated in Table 1. Early discussions are provided by Roseberry and Dole (1937), Marshall (1957), Hastings and Turner (1964), Lowe (1964b), Steenbergh (1970), and Anon. (1970). The Monument vegetation was mapped by Roseberry and Dole (1939). Additional mapping of the vegetation is being conducted currently by William W. Shaw at the University of Arizona using the BLP system (see Lowe 1964b, Lowe and Brown 1973, 1982; Brown and Lowe 1980; Brown, Lowe, and Pase 1980 and elsewhere). The vegetation of the Rincon Mountains is most recently discussed in Bowers and McLaughlin (1987).

The following are the biome and the life-zone equivalents for natural communities at Saguaro National Monument; the letters in parentheses are the designations used in the annotated list of species in Table 1, which is given at the species, rather than subspecies, level:

Desertscrub	(D)	Sonoran Desertscrub	=	Lower Sonoran Life-zone	(LS)
Grassland	(G)	Semidesert Grassland	=	Upper Sonoran Life-zone	(US)
Woodland	(W)	Evergreen Woodland	=	Upper Sonoran Life-zone	(US)
Forest	(F)	Montane Conifer Forest	=	Transition Life-zone	(T)
Riparianland	(R)	Riparian Scrub, Woodland, Forest	=	All Life-zones at SAGU	

Sonoran Desertscrub

Creosotebush desertscrub, Paloverde-Saguaro desertscrub, and their ecotones predominate on site from 2020 ft upward to ecotones with Desert Grassland at 3700 ft and above.

Semidesert Grassland (Desert Grassland)

Climax mixtures of native perennial grasses, native dry-tropic shrubs and stem-succulents, mesquite and other often disclimax weedy perennials, prevail on widely altered native dry-tropic grasslands between 3700 and ca 5000 ft. At and above ca 4500 ft, savanna-like ecotones are formed with oaks of the evergreen woodland above.

Evergreen Woodland

Oak Woodland (Encinal) and Pine-Oak Woodland. At the lower woodland limits of 4000-4500 ft according to slope exposure, the encinal is an evergreen oak woodland (Emory, Blue, and Arizona Oak) with the occasional presence of a juniper and pinyon representation in the woodland. With gradual increase in elevation into the pine-oak woodland above, Chihuahua Pine joins with Mexican Pinyon, Alligator-bark Juniper, and several evergreen oaks--principally Silverleaf Oak, Arizona Oak, Emory Oak--and others. Mexican pine-oak woodland above 7000 ft gradually merges with the montane conifer forest above.

Montane Conifer Forest

The montane conifer forest is a mixed conifer forest with primarily pine and fir dominance varying according to slope exposure and elevation from approximately 7000 ft to the top near 8600 ft. Ponderosa Pine is the principal forest conifer, providing a Ponderosa Pine forest with Gambel Oak, Madroño, and others. This community usually becomes a mixed conifer forest with increasing elevational presence of Douglas-fir, White Fir, and White Pine. The latter three coniferous trees reach their greatest stature and density on north-facing slopes above 7800 ft.

Mountain meadow grassland communities, in the forest above approximately 7500 ft, are of relatively infrequent occurrence in the Rincon Mountains.

Riparian Communities

Treeform riparian woodland and forest communities are dominated principally by broadleaved, winter-deciduous trees and shrubs including cottonwood, willow, ash, sycamore, walnut, elderberry, choke-cherry, locust, alder, mulberry, boxelder, maple, and others.

Table 1. Amphibians and reptiles at Saguaro National Monument, Arizona. Species, habitats, observed relative abundance, and surface activity. Parentheses, as shown by (x), indicate that the species occurs or is estimated to occur *marginally* into the habitat. LS, US, and T refer to Lower Sonoran, Upper Sonoran, and Transition Life-zones.

Species	Habitat					Activity	Abundance
	D (LS)	G (US)	W (US)	F (T)	R		
AMPHIBIANS							
Frogs and Toads							
Family Pelobatidae							
Scaphiopus couchi Desert Spadefoot (Toad)	x	x				N	2,locally
Scaphiopus multiplicatus Southern Spadefoot (Toad)	x	x				N	3,locally
Family Bufonidae							
Bufo alvarius Sonoran Desert Toad	x	x			x	N	2
Bufo cognatus Great Plains Toad	x	x				N	3
Bufo punctatus Red Spotted Toad	x	x	x		x	N,(D)	2
Family Hylidae							
Hyla arenicolor Canyon Treefrog	x	x	x	x	x	N,D	1,locally
Family Ranidae							
Rana catesbeiana Bullfrog	non-native (introduced)						
Rana yavapaiensis Yavapai Leopard Frog	x	x	x	?	x	N,D	1,locally

Table 1. (Continued).

Species	Habitat					Activity	Abundance
	D (LS)	G (US)	W (US)	F (T)	R		
REPTILES							
Turtles							
Family Kinosternidae							
Kinosternon sonoriense Sonoran Mud Turtle	x	x			x	D,N	2,locally
Family Emydidae							
Terrapene ornata Western Box Turtle	(x)	x				D,N	5
Family Testudinidae							
Gopherus agassizi Desert Tortoise	x	(x)				D	4
Lizards							
Family Helodermatidae							
Heloderma suspectum Gila Monster	x	x				D,(N)	4
Family Gekkonidae							
Coleonyx variegatus Western Banded Gecko	x	x				N	3
Family Iguanidae							
Callisaurus draconoides Zebratailed Lizard	x				x	D	1,locally

Table 1. (Continued).

Species	Habitat					Activity	Abundance
	D (LS)	G (US)	W (US)	F (T)	R		
Family Iguanidae (Contd.)							
Cophosaurus texanus Greater Earless Lizard	x	x				D	3
Crotaphytus collaris Common Collared Lizard	x	x				D	3
Gambelia wislizeni Leopard Lizard	x	x				D	4
Holbrookia maculata Lesser Earless Lizard	x	x				D	2
Phrynosoma douglassi Shorthorned Lizard				x		D	4
Phrynosoma solare Regal Horned Lizard	x	(x)				D	3
Sceloporus clarki Clark Spiny Lizard	x	x	x			D	2
Sceloporus magister Desert Spiny Lizard	x	(x)				D	3
Sceloporus undulatus Eastern Fence Lizard			x	x		D	2,locally
Urosaurus ornatus Tree Lizard	x	x	(x)	?	x	D	1
Uta stansburiana Sideblotched Lizard	x					D	3,locally
Family Scincidae							
Eumeces obsoletus Great Plains Skink	(x)	x	(x)		x	D	5

Table 1. (Continued).

Species	Habitat					Activity	Abundance
	D (LS)	G (US)	W (US)	F (T)	R		
Family Teiidae							
Cnemidophorus burti Canyon Spotted Whiptail (Lizard)	X	(X)			X	D	3,locally
Cnemidophorus sonorae Sonoran Spotted Whiptail (Lizard)	(X)	X	X		X	D	2
Cnemidophorus tigris Western Whiptail (Lizard)	X					D	1
Family Anguidae							
Gerrhonotus kingi Madrean Alligator Lizard	(x)	x	x	x	x	D	3,locally
Snakes							
Family Leptotyphlopidae							
Leptotyphlops humilis Western Blind Snake	x	x				N	3,locally
Family Colubridae							
Arizona elegans Glossy Snake	x	x				N	5
Chilomeniscus cinctus Banded Sand Snake	x				x	N	4,locally
Diadophis punctatus Ringneck Snake	(x)	(x)	x		x	D,(N)	5
Gyalopion canum Chihuahuan Hooknosed Snake	(x)	x				N	5
Hypsiglena torquata Night Snake	x	x	(x)			N	4

Table 1. (Continued).

Species	Habitat					Activity	Abundance
	D (LS)	G (US)	W (US)	F (T)	R		
Family Colubridae (Contd.)							
Lampropeltis getulus Common Kingsnake	x	x			x	D,N	4
Lampropeltis pyromelana Sonoran Mountain Kingsnake			x	x	x	D	3
Masticophis bilineatus Sonoran Whipsnake	(x)	x	x			D	3
Masticophis flagellum Coachwhip	x	x				D	2
Phyllorhynchus browni Saddled Leafnosed Snake	x					N	4
Pituophis melanoleucus Bullsnake or Gopher Snake	x	x	x	(x)		D,N	2
Rhinocheilus lecontei Longnosed Snake	x	(x)				N,(D)	3
Salvadora grahamiae Mountain Patchnosed Snake	(x)	x	x			D	5
Salvadora hexalepis Western Patchnosed Snake	x	x				D	3
Sonora semiannulata Ground Snake	x	x			x	D,N	5
Tantilla hobartsmithi Southwestern Blackheaded Snake	x	x			x	N	3,locally

Table 1. (Continued).

Species	Habitat					Activity	Abundance
	D (LS)	G (US)	W (US)	F (T)	R		
Family Colubridae (Contd.)							
Thamnophis cyrtopsis Blacknecked Garter Snake	x	x	x		x	D,(N)	2,locally
Thamnophis marcianus Checkered Garter Snake	x	x			x	D,N	5
Trimorphodon biscutatus Lyre Snake	x	x				N	4
Family Elapidae							
Micruroides euryxanthus Western Coralsnake	x	x			x	D,N	4
Family Viperidae							
Crotalus atrox Western Diamondback Rattlesnake	x	x				D-N	1
Crotalus cerastes Sidewinder	x					N,D	5,locally
Crotalus molossus Blacktailed Rattlesnake	x	x	x	x		D,N	3
Crotalus scutulatus Mojave Rattlesnake	x	x				D-N	3
Crotalus tigris Tiger Rattlesnake	x	(x)				N,D	2
Crotalus viridis Western Rattlesnake		(x)	x	x		D,N	4

THE HIGHER CATEGORIES OF AMPHIBIANS AND REPTILES AT SAGUARO NATIONAL MONUMENT

The 57 total amphibian and reptilian species at Saguaro National Monument are listed in Table 1. Each of the species belongs to an hierarchical series of higher systematic categories. Among the more than two dozen systematic categories available for use as needed in a particular classification, there are *seven obligate categories* in the sytematic hierarchy to which every species belongs:

- Kingdom
  - Phylum
    - Class
      - Order
        - Family
          - Genus
            - Species

The categories of *species* and *subspecies* are the *lower categories* in the hierarchy. The *higher categories* in the systematic hierarchy are those above the species level; thus the *genus* and *subgenus* are the lowermost higher categories in the hierarchy. The genera are given in Table 1, where the genus is the first part of the two-part (binomial) species name.

In the following classification for the herpetofauna at SAGU, the families are listed in alphabetical order, rather than in their presumed phylogenetic order. Note that while the total number of species is 57, the total number of *native species* is 56; the Bullfrog is a non-native (introduced) species that is established on the Monument (see Table 1):

- Kingdom Animalia
  - Phylum Chordata
    - Subphylum Vertebrata
      - Class Amphibia (8 species in 4 genera)
        - Order Anura--Frogs and Toads (8)
          - Family Bufonidae--Toads (3)
          - Family Hylidae--Treefrogs (1)
          - Family Pelobatidae--Spadefoot Toads (2)
          - Family Ranidae--Frogs (2)
      - Class Reptilia (49 species in 35 genera)
        - Order Testudines--Turtles (3)
          - Family Emydidae--Pond and Box Turtles (1)
          - Family Kinosternidae--Mud and Musk Turtles (1)
          - Family Testudinidae--Tortoises (1)

Order Squamata (46)
  Suborder Sauria--Lizards (19)
    Family Helodermatidae--Beaded Lizards (1)
    Family Gekkonidae--Geckos (1)
    Family Iguanidae--Iguanids (12)
    Family Scincidae--Skinks (1)
    Family Teiidae--Whiptails and Allies (3)
    Family Anguidae--Alligator Lizards and Allies (1)
  Suborder Serpentes--Snakes (27)
    Family Leptotyphlopidae--Blindsnakes (1)
    Family Colubridae--Colubrids (1)
    Family Elapidae--Coralsnakes and Allies (1)
    Family Viperidae--Vipers and Pit-Vipers (6)

THE VENOMOUS REPTILES AT SAGUARO NATIONAL MONUMENT

Concentrated in the environs of the Monument is one of the greatest diversities of venomous reptiles in the United States. Eight species of venomous reptiles potentially dangerous to man occur at Saguaro. Several other species of venomous reptiles *not* dangerous to man--rearfanged snakes such as the Lyre Snake and Blackheaded Snake--also occur on site.

The eight potentially dangerous venomous species at SAGU are the Gila Monster, Western Coralsnake, and six species of rattlesnakes (Table 1). The six species of rattlesnakes represent more than half of all the rattlesnakes species in Arizona (11), the state with the greatest representation in the United States.

Table 2. The eight potentially dangerous venomous species at Saguaro National Monument. See Table 1.

Species	SAGU West	SAGU East
Gila Monster	x	x
Western Coralsnake	x	x
Sidewinder Rattlesnake	x	not present
Western Diamondback Rattlesnake	x	x
Mohave Rattlesnake	x	x
Tiger Rattlesnake	x	x
Blacktailed Rattlesnake	x	x
Arizona Black Rattlesnake (a subspecies of the Western Rattlesnake)	not present	x

SIX "HYPOTHETICAL" SPECIES

The possible occurrence on site at SAGU of the following six "hypothetical" species should be considered.

Ambystoma tigrium, Tiger Salamander.--In Arizona and elsewhere, the tiger salamander is a native species that is widely distributed beyond its natural distribution (often for bait, and bait commercial purposes) into lakes, ponds, stock tanks, et al. Tiger salamanders are well established in stock tanks in the Reddington Pass area between the Rincon Mountains and Santa Catalina Mountains, near the north boundary of Saguaro National Monument. Re: Rincon Mountain District.

Rana chiricahuensis, Chiricahua Leopard Frog.--Voucher(s) required. A local population of *Rana* may still occur on the Monument. Early vouchers are no longer available in the Monument Headquarters collection ("tossed out during various 'house-cleanings'"). The known material represents *Rana yavapaiensis*, Yavapai Leopard Frog. Re: Rincon Mountain District.

Dipsosaurus dorsalis, Desert Iguana.--Voucher(s) required. A once abundant species in the Avra Valley until the early 1960's, it has been nearly eliminated there as a result of pesticide spraying from crop-duster aircraft. Throughout its range in the Sonoran Desert, the Desert Iguana enters lower bajada communities in limited fashion, above the valley fill, as does the Sidewinder (*Crotalus cerastes*).

We made several observations during the period 1950-1975 to within 2-3 miles of the current west boundary of the Monument; a recent observation of a courting pair on the bajada at 0.5 miles from the Monument boundary was made by Howard E. Lawler of the Arizona Desert Museum. It is entirely possible that this species did occur and still does occur in one or more limited pockets on the western bajada of the Tucson Mountains, above the valley fill on what is now Saguaro Monument bajada property. Re: Tucson Mountain District.

Cnemidophorus flagellicaudus, Gila Spotted Whiptail.--Voucher(s) required. Known from the Reddington Pass area between the Rincon Mountains and Santa Catalina Mountains, and on the north slope of the Santa Catalinas. May occur on site on the north slope of the Rincons. Re: Rincon Mountain District.

Phyllorynchus decurtatus, Spotted Leafnosed Snake.--Voucher(s) required. This snake remains a questionmark case similar to that of the Desert Iguana, although it is a less likely candidate to turn up inside of the Monument's westernmost bajada fence line. A principal reasons for this is that the

Spotted Leafnosed Snake is somewhat more soil-texture sensitive than is the Desert Iguana. Nearest observations to the Monument boundary fence for this species have been at slightly over 3 miles distance, except for a more recent closer record by H. G. Lawler (pers. com.). As with the remaining species in the Lower Colorado Valley desert herpetofauna that reach their easternmost limit in North America here in the once-unique Avra Valley bordering the Tucson Mountains, the Spotted Leafnosed Snake is either near elimination in the Avra Valley or is already gone there forever. The process took only one human generation. Re: Tucson Mountain District.

Thamnophis eques, Mexican Garter Snake.--Voucher(s) required. Known from the Reddington Pass area, outside (north of) and near the Monument boundary. Re: Rincon Mountain District.

TWO SPECIES NOT AT SAGUARO NATIONAL MONUMENT

Two native species in the Arizona herpetofauna that have been considered at one time or another to occur at Saguaro National Monument, *Bufo woodhousei* and *Sauromalus obesus*, do *not* occur naturally on the Monument.

Woodhouse Toad.--*Bufo woodhousei* is a lowland riparian species in southern Arizona and adjacent northern Sonora, Mexico, and now entirely eliminated from the Santa Cruz River basin at and in the vicinity of Tucson, Arizona. It continues to be erroneously assumed to occur at SAGU in the coniferous forest of the Rincon Mountains (Mica Mountain).

Chuckwalla.--The locations of the natural local populations of *Sauromalus obesus* that are nearest to Saguaro National Monument are in the Waterman Mountains and Silver Bell Mountains west of the Tucson Mountains, on the west side of Avra Valley. There the Chuckwalla reaches its most eastward geographic distribution at this latitude (32° 22' N Lat.). Due to a recent possible introduction, or a subsequent one, the Chuckwalla may become established on site in the Tucson Mountain District of the Monument.

CIRCADIAN AND SEASONAL SURFACE ACTIVITY

Surface activity schedules (diurnal, nocturnal) are indicated for the behavioral periodicity of both the amphibians and reptiles, in Table 1.

Diurnal	day activity
Crepuscular	twilight activity
Nocturnal	night activity

Species in the herpetofauna are often more or less tightly diurnal (D) or more or less tightly nocturnal (N). Others are both diurnal and nocturnal, but predominantly one or the other [D, (N), or N, (D)]. Some are arguably the same or subequally so: (1) during the same 24-hour period during the same season (D, N or N, D), or (2) they are mostly or wholly one or the other during different seasons of the year's overall activity time (D-N, in alphabetical order).

In the herpetofauna of Saguaro National Monument, there are no *predominantly crepuscular* species, as, for example, the Western Shovelnosed Snake (*Chionactis occipitalis*). With a few notable exceptions, both "nocturnal" species and "diurnal" species exhibit some crepuscular activity in their behavioral periodicity.

ABUNDANCE

Estimates for relative abundance of species are given in Table 1. The five-category system for ranking used by Lowe and Johnson (1975) and Johnson and Lowe (1979) and in general application by other workers in the field is used herein (Tables 3 and 4). Ranking terms (Abundant, Very Common, Common, Uncommon, and Rare) refer only to the *observed* relative abundance. For example, a "Rare" species such as the Madrean Alligator Lizard is only rarely observed in the Monument area but may be locally common in terms of its *actual* population density. In tabular compilation of data, rank numbers (1-5) substitute for relative abundance categories (see below).

While a single schedule is valid for herpetofauna (e.g., abundant to rare, or 1-5), for several reasons it is not realistic to assign one set of criteria (for the schedule) to all taxa in the herpetofauna. Different criteria are necessary for amphibians versus reptiles, and often for groups within each.

AMPHIBIANS

Peak activity of many amphibian taxa occurs on warm wet mid-summer nights. This is especially true of toads (*Bufo*) and spadefoot toads (*Scaphiopus*). Relative abundance categories (Table 3) are based on, and indicate, what an observer might expect to see during a nocturnal visit to a particular habitat on site during the mid-summer rainy period (late June-August).

Table 3. Five category system for relative abundance of amphibians. See Table 1.

Rank No.	Rank	Abbr.	Interval[1]
1	Abundant	A	$x > 20$
2	Very Common	VC	$20 \geq x > 10$
3	Common	C	$10 \geq x > 3$
4	Uncommon	UC	$3 \geq x > 1$
5	Rare	R	$1 \geq x$

1. Fewer than one ($1 \geq x$) individual animal may result from averaging observation data.

All amphibian species on site are anurans (toads and frogs). No population of the Tiger Salamander (*Ambystoma tigrinum*), native or introduced, has been observed yet on site. Ecological information for each species is provided in Table 1, for habitat (biotic community at SAGU), relative abundance, and surface activity. No amphibian was observed on the Monument in winter. Some species emerge with summer rainfall in late June or early July (spadefoot toads). Most species emerge with winter-spring rainfall, and the Sonoran Toad emerges in April-May independent of rainfall as does the Canyon Treefrog in some habitats.

Local weather conditions can greatly affect opportunity for observation. This is especially true in the arid and semiarid Southwest. Reduced rainfall and elevated temperatures significantly affect microhabitat conditions throughout the Monument area, and reduce the probability of visitor contact with amphibian species during much of the year.

The Monument is a day-use area. Thus most visitors do not often encounter toads and frogs. Absence of permanent surface water in the more frequently visited on site areas also reduces encounter probabilities. Nevertheless, the native anurans comprise an especially interesting and important portion of the Saguaro National Monument biota.

REPTILES

All species of reptiles known from the Monument are turtles, lizards, or snakes.

Lizards

The peak surface activity of lizards usually occurs during morning hours on warm-season days. A second and lesser peak may occur in mid to late afternoon. In spring and autumn, diurnal lizard activity may begin later in the morning and extend more or less evenly through late afternoon. During any season, daily activity is affected by rain and/or cold weather including that on preceding days or nights.

Relative abundance categories in Table 4 are based on, and indicate, what an observer might expect to see during an activity peak for a particular species of lizard. Note that intervals differ from those for amphibians (see above).

Table 4. Five category system for relative abundance of lizards. See Table 1.

Rank No.	Rank	Abbr.	Interval[1]
1	Abundant	A	$x > 25$
2	Very Common	VC	$25 \geq x > 15$
3	Common	C	$15 \geq x > 5$
4	Uncommon	UC	$5 \geq x > 1$
5	Rare	R	$1 \geq x$

Estimated relative abundances of all species of lizards occurring on site are given in Table 1.

As noted above under "Amphibians", local weather conditions govern and may cause changes in reptile behavior and activity in all seasons. Major activity by lizard species begins in March-April in the Monument area and extends through October. Juveniles of some species and more rarely adults of some others may be seen in November and February. Because of their diurnal activity patterns, most species of lizards are far more conspicuous to the usual Monument visitor than are amphibians or snakes.

Snakes

Unlike most species of lizards, snakes are not encountered frequently enough to allow the construction of a relative abundance category system empirically equivalent to those used for amphibians and lizards. With occasional exceptions such as denning species, snakes are not encountered often enough to be considered truly "common" in the sense in which some amphibians and lizards are "common." Thus snakes are ranked within-group from most to least commonly encountered species in the Monument. Such rankings are not intended to reflect *actual* population density relationships, especially among the more secretive, smaller and/or nocturnal species.

Because of their retiring habits and desire to seek sanctuary, snakes are not often noticed by the usual Monument visitor. While both poisonous and non-poisonous species are found on site, and non-poisonous species may be more frequently encountered, they do not leave so lasting an impression on visitors.

Turtles

While few visitors to the Monument will encounter a box turtle or a mud turtle, there is a fair chance of seeing a desert tortoise --particularly during July-October--crossing trails and roads, and in picnic areas. Box turtles are rare on site. Mud turtles are locally common but only in a few permanent stream areas, as in Wildhorse Canyon and in Chimenea Creek; the latter is now with limited access.

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REFERENCES

Anonymous. 1970. Saguaro National Monument: basic data. U.S. National Park Service, Saguaro National Monument, Tucson, Arizona.

Black, K. L. 1982. An annotated checklist of the herpetofauna of Saguaro National Monument, Rincon Mountain Unit. U.S. Nat. Park Service, Saguaro National Monument, Tucson, Arizona.

Bowers, J. E. and S. P. McLaughlin. 1987. Flora and vegetation of the Rincon Mountains. Desert Plants, 8:51-94.

Brown, D. E. and C. H. Lowe. 1980. Biotic communities of the Southwest. USDA Forest Service, Rocky Mountain Forest and Range Exp. Sta., Gen. Tech. Rept. RM-78: map, scale 1:1,000,000.

Brown, D. E., C. H. Lowe and C. P. Pase. 1980. A digitized systematic classification for ecosystems with an illustrated summary of the natural vegetation of North America. USDA Forest Service, Rocky Mountain Forest and Range Exp. Sta., Gen. Tech. Rept. RM-78:1-93.

Hastings, J. R. and R. M. Turner. 1964. The changing mile. University of Arizona Press, Tucson.

Johnson, T. B. and C. H. Lowe. 1979. Amphibians and reptiles of the Coronado National Memorial, Arizona. *In* E. L. Cockrum et. al., University of Arizona, Nat. Park Resources Studies Unit, Tech. Rept. 5:1-124.

Lowe, C. H. 1964a. The amphibians and reptiles of Arizona. *In* C. H. Lowe, ed., The vertebrates of Arizona, University of Arizona Press, Tucson.

Lowe, C. H. 1964b. Arizona landscapes and habitats. *In* C. H. Lowe, ed., The vertebrates of Arizona, University of Arizona Press, Tucson.

Lowe, C. H. and D. E. Brown. 1973. The natural vegetation of Arizona. State of Arizona, Arizona Resources Information System, ARIS Cooperative Publication, No. 2:1-53.

Lowe, C. H. and T. B. Johnson. 1975. Survey of the reptiles and amphibians of Fort Bowie National Historic Site. *In* E. L. Cockrum, et. al., Survey of the vertebrates fauna, Fort Bowie National Historical Site, Arizona. University of

Arizona, Coop. Nat. Park Resources Studies Unit, Tech. Rept. 2:1-120.

Lowe, C. H. and D. E. Brown. 1982. Introduction. *In* D. E. Brown, ed., Biotic Communities of the American Southwest--United States and Mexico. Desert Plants, 4:8-16.

Lowe, C. H., C. R. Schwalbe, and T. B. Johnson. 1986. The venomous reptiles of Arizona. Arizona Game and Fish Dept., Phoenix.

Marshall, J. T. 1957. Birds of the pine-oak woodland in southern Arizona and adjacent Mexico. Pacific Coast Avifauna, no. 32:1-125.

Roseberry, R. D. and N. E. Dole. 1939. The vegetation type survey of Saguaro National Monument. U.S. National Park Service, Saguaro National Monument, Tucson, Arizona.

Stebbins, R. C. 1985. A field guide to western reptiles and amphibians. Peterson Field Guide Series, Houghton Mifflin Co., Boston.

Steenbergh, W. F. 1970. *In* Anon. 1970, Saguaro National Monument: basic data. U.S. National Park Service, Saguaro National Monument, Tucson, Arizona.